

Hugo Mesquita Vasconcelos

R&D Mechanical Engineer · Automation · Embedded AI & Structural Monitoring

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Mechanical engineer with experience in R&D, structural monitoring and machine learning. Passionate about developing innovative solutions, with broad technical knowledge to tackle end-to-end hardware and software challenges from a mechanical engineering perspective, from the first prototype to systems deployed in hospitals, at sea and on industrial machines. Eager to learn, with strong teamwork and leadership experience.

EXPERIENCE

R&D Engineer — INEGI, Advanced Monitoring and Structural Integrity unit, Porto **2023 – Present**

Python · machine learning · C/C++ · C# · ESP32 · Raspberry Pi · KiCad · SolidWorks · 3D-DIC · DJI SDK · GNSS

- **AneurysmTool** (FCT, with Hospital de Santa Marta and NOVA): designed and built a hospital-compatible rig that inflates aortic aneurysm tissue to diastolic and systolic pressure (PID control) and measures 360° full-field displacement with 3D-DIC. Validated within 1.04% of the finite-element model (paper).
- **Mauser** (with the Portuguese Navy): main person responsible for the technical development of low-power AI for passive acoustic vessel detection. An always-on ESP32-S3 wakes a Raspberry Pi 5 classifier only when a ship is present, allowing the future development of an edge-AI buoy (paper).
- **Marewind** (EU Horizon 2020, offshore wind): ML models predicting subsea structural strain from sea state (mean $R^2 = 0.96$); custom battery-powered strain DAQ (PCB, firmware) for a 500 kg structure deployed 30 m underwater off Sines; built a DJI Matrice 300 camera payload with GPS-PPS synchronisation for two-drone 3D-DIC on wind turbine blades and flew the campaigns; drone thermography of blades.
- **PRR Produtech** (with Mecânica Exata and Bairrimoldes): digital twin of a 400 t servo press; linked the multibody model to the monitoring system and built the on-machine 3D visualiser. Presented to the president of the PRR National Monitoring Committee.
- **Industry projects:** off-grid GNSS and accelerometer displacement monitoring of 80 m and 90 m towers in Germany, in service since 2025; optical measurement of rail support block displacement for Metro do Porto; a high-pressure air cannon (250 m/s); and several smaller projects.
- **Research and funding:** 4 first-author papers (Bioengineering, JMSE, 2× Procedia Structural Integrity); session chair at ECF24; talks at ICSI (2023, 2025); poster at IEEE SITW, Aberdeen (2026); contributed to the technical annexes of national funding proposals.

Personal projects

- **nomorefogos**: autonomous waypoint drone with its own planning app and on-board AI that classifies the camera feed for early fire detection; validated in test flights.
- **Católicos no Porto**: non-profit website for Porto's Catholic community.

Both were built with LLM-assisted development; I also build local AI agents and MCP servers.

EDUCATION & CERTIFICATIONS

MSc Mechanical Engineering, specialisation in Automation — FEUP, University of Porto **2020 – 2022**

BSc Mechanical Engineering — FEUP, University of Porto **2016 – 2020**

BEST Summer Course — Gheorghe Asachi Technical University of Iași, Romania **2019**

Certifications — GWO Basic Safety Training (incl. working at heights) · Machine Learning · Project Management

LEADERSHIP

Maestro, Missa da Bênção das Pastas: conducting 50+ singers for an audience of over 5,000 **2020 – Present**

Maestro and musical director, Meninos do Coro: 40-voice university choir; fundraising concerts.

FEUP head of Missão País (2019) · organiser of **Tochas** summer camps for five years.

LANGUAGES & MUSIC

Portuguese native · **English** professional · **Spanish, French** basic

Violin since age 5 (8th grade, Academia de Música de Costa Cabral) · guitar, Portuguese guitar, bass, singing.